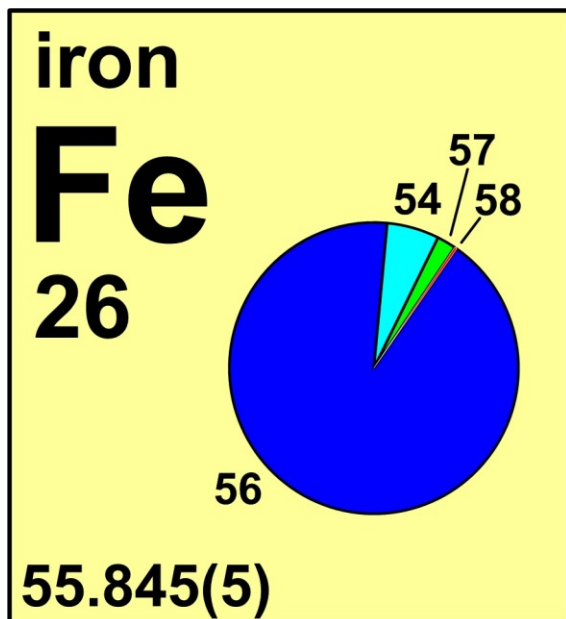


iron

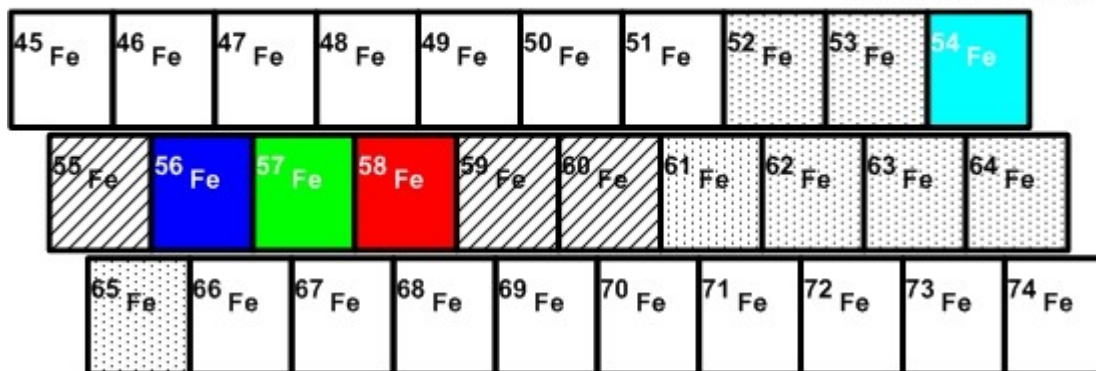


Stable isotope	Atomic mass*	Mole fraction
⁵⁴ Fe	53.939 6105	0.058 45
⁵⁶ Fe	55.934 9375	0.917 54
⁵⁷ Fe	56.935 394	0.021 19
⁵⁸ Fe	57.933 2756	0.002 82

* Atomic mass given in unified atomic mass units, u.

Half-life of radioactive isotope

Less than 1 second
Between 1 second and 1 hour
Greater than 1 hour



Important applications of stable and/or radioactive isotopes

Isotopes in geology, hydrology or planetary sciences

- ⁶⁰Fe is an extinct radionuclide which had a long half-life (1.5 Myr) and had fully decayed into ⁶⁰Ni. Abundance of ⁶⁰Ni in extraterrestrial material such as meteorites can be used to gain further insight into the early history of our solar system.

Isotopes in tracer studies

- Natural iron enriched in its least abundant stable isotopes, ⁵⁷Fe and ⁵⁸Fe, are commonly used as tracers in human studies to assess absorption, excretion, distribution and utilization of Fe in basic and applied research.

- 2) Isotopically enriched iron can also be used to study magnesium transfer processes in the biosphere, geosphere and hydrosphere as well as in isotope dilution mass spectrometry for quantitative analysis of iron. Two of its radioisotopes (^{55}Fe , half-life: 2.7; ^{59}Fe , half-life: 44.5 d) have a sufficiently long half-life for such applications but potential health and environmental hazards limit their use to diagnostic applications in patient care (hematology and disorders of iron metabolism).
- 3) Small natural variations in the abundance of iron isotopes can be used to study mass transfer processes in nature and chemical equilibria.

Isotopes in medicine

- 1) ^{52}Fe with its short half-life of 8.2 h is a positron emitter that can be used in PET studies. It can be produced in a cyclotron from stable ^{50}Cr by alpha particle capture.
- 2) Stable ^{56}Fe is used for production of radioactive ^{55}Co as a positron emitting isotope for PET applications.

Isotopes in industrial applications and engineering

- 1) ^{55}Fe , produced from stable ^{54}Fe , is a beta emitting nuclide that serves as an electron source together with ^{63}Ni in electron capture detectors. Electron capture detectors are used as thickness gauges or as detectors for organic analytes in gas chromatography.